

## REMARKS

In connection with the above-identified patent application, the Examiner issued an Office Action dated March 16, 2007 in which the Examiner rejected claims 1-4, 10-12, 15-17 and 24-31. The Examiner objected to claims 15 and 27 for informalities and to claim 30 for duplication. The Examiner rejected claims 1-4, 15-17 and 27-30 under 35 U.S.C. § 103(a) as being unpatentable over United States Published Patent Application 2002/0144738 to *Unger* in view of United States Patent No. 6,454,547 to *Kohlhaas et al.* and rejected claims 10-12, 24-26 and 31 under 35 U.S.C. § 103(a) as being unpatentable over *Unger* in view of *Kohlhaas et al.* further in view of United States Patent No. 5,955,801 to *Romero et al.*

Claims 1-4, 10-12, 15-17 and 24-31 were pending in this application. Claim 30 has been canceled without prejudice, and claims 1, 15 and 27 have been amended. In view of the arguments set forth below, claims 1-4, 10-12, 15-17, 24-29 and 31 are allowable, and the Examiner is respectfully requested to withdraw the rejection and issue a Notice of Allowance.

### I. CLAIM OBJECTIONS

The Examiner objected to claims 15, 27 and 30. Claims 15 and 27 have been amended in accordance with the Examiner's recommendation, and claim 30 has been canceled without prejudice. Thus, the Examiner is respectfully requested to withdraw the rejection.

## **II. REJECTIONS UNDER 35 U.S.C. § 112**

The Examiner rejected claim 15 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention. The Examiner stated that claim 15 recites the limitation "said cavity" in the 6<sup>th</sup> line of claim 15 and that there is a lack of antecedent basis for this limitation in the claim. Claim 15 has been amended to change "said cavity" to "said pumping chamber." Thus, the Examiner is respectfully requested to withdraw the rejection.

## **III. CLAIM REJECTION UNDER 35 U.S.C. §103**

The Examiner rejected claims 1-4, 15-17 and 27-30 under 35 U.S.C. §103(a) as being anticipated by United States Published Patent Application 2002/0144738 to *Unger* in view of United States Patent No. 6,454,547 to *Kohlhaas et al.* The Examiner stated that *Unger* discloses a micropump made of a fully monolithic body formed from between about two layers of silicon and about five layers of silicon and having a thickness of about no more than 12 microns. The Examiner also stated that it has been held that where the general conditions of a claim are disclosed in the prior art, it is not invention to discover the optimum or workable ranges. The Examiner however, admitted that *Unger* fails to teach a method of pumping fluids with a rotatable disc, but argued that such elements are disclosed in *Kohlhaas*. The Examiner concluded that it would have been obvious to one of ordinary skill

in the art at the time of the invention to have modified the pump structure of *Unger* with the pump structure of *Kohlhaas* in order to create a pump with the smallest possible dimensions which can be produced cost effectively.

*Unger* is directed to a method of fabricating an elastomeric pump formed from a plurality of layers. In particular, *Unger* discloses that the elastomeric structure may be formed from first and second elastomeric layers that are bonded together. As stated in paragraph [0012],

the present monolithic elastomeric structures are constructed by bonding together two separate layers of elastomer with each layer first being separately cast from a micromachined mold. Preferably, the elastomer used is a two-component addition cure material in which the bottom elastomer layer has an excess of one component, while the top elastomeric layer has an excess of another component. In an exemplary embodiment, **the elastomer used is silicone rubber**. Two layers of elastomer are cured separately. Each layer is separately cured before the top layer is positioned on the bottom layer. The two layers are then **bonded** together . . . . This creates a monolithic three-dimensional patterned structure composed entirely of two layers of bonded together elastomer.

Independent claims 1, 15 and 27 are directed to a micropump formed from "a monolithic body formed from a single material." In contrast, *Unger* discloses a micropump formed from layers formed from a first material and a bonding agent used to bond the layers together. Thus, *Unger* discloses a micropump formed from multiple materials. In contrast, the claimed micropump is formed from a single material.

Furthermore, *Unger* discloses an elastomer, such a flexible silicone rubber, which provides the pumping action needed for the design disclosed in *Unger*. The pump disclosed in *Unger* works only with a flexible material capable of retaining its original shape when not under a load and flexing when loaded. In contrast, the claimed invention is directed to a pump, which is formed from silicon. Silicon is a hard, rigid material and differs substantially from silicone rubber, which is the material used to form the pump of *Unger*. Silicone disclosed in *Unger* is drastically different from the silicon in the claimed invention. Thus, *Unger* teaches away from the claims invention. Substituting the silicon of the claimed invention with the silicone rubber of *Unger* would not have been obvious to one of ordinary skill in the art upon reading *Unger*.

While *Unger* discloses that the *Unger* pump is a monolithic structure, it is actually a pump that is formed from a plurality of layers of material that are bonded together. Thus, the structure that is disclosed is a not a monolithic structure, rather, the *Unger* pump is formed from a plurality of monolithic layers bonded together. In sharp contrast, the claimed invention is directed to a monolithic pump formed from a single material. The claimed monolithic pump is formed from a rigid material, silicon, not silicone rubber, as disclosed in *Unger*.

The claimed monolithic pump also utilizes silicon micromachining technology to create a fully intact pump along with its actuator on a silicon wafer in batch mode. The ability to create the claimed complex structure on a silicon wafer is by no way obvious based

on *Unger* and *Kohlhaas*. For example, *Unger* uses two layer structures to make plastic envelopes, and *Kohlhaas* discloses a fuel pump for a vehicle formed from plastic and an undisclosed material. Neither *Unger* nor *Kohlhaas* discloses silicon surface micromachining, as used to create the claimed invention. Utilizing silicon surface micromachining to produce mechanical pumps such as the one disclosed is not obvious. In particular, surface micromachining integrates all in one piece, i.e. the pumping, the channels, the inlets, outlets and the actuator and the connections to power all on the monolithic silicon piece, which is different from the pumps disclosed in *Unger* and *Kohlhaas*. In addition, the silicon surface micromachining is batch printing/removing in which all designs undergo the same processes at the same time. The silicon surface micromachining process also creates all pump components at the same time and maintains connectivity with the actuator while eliminating leakage. Thus, neither *Unger* nor *Kohlhaas* taken singularly or collectively disclose or render obvious the claimed invention. Therefore, the Examiner is respectfully requested to withdraw the rejection.

The Examiner also rejected claims 10-12, 24-26 and 31 under 35 U.S.C. §103(a) as being unpatentable over *Unger* in view of *Kohlhaas* and further in view of United States Patent No. 5,955,801 to *Romero et al.* The Examiner stated that *Unger* and *Kohlhaas* in combination disclose the claimed invention except for the electrostatic comb drive, which the Examiner stated was disclosed in *Romero et al.* Claims 10-12, 24-26 and 31 depend from the independent claims 1, 15 and 27, which are allowable for the reasons previously set forth.

## **VI. PETITION FOR THREE MONTH EXTENSION OF TIME**

This is a Petition for a Three Month Extension of Time pursuant to 37 CFR § 1.136.

Please charge the fee in the amount of \$510.00 for a three (3) month extension of time pursuant to 37 CFR § 1.17(a)(3) and charge any underpayment or credit any overpayment to Deposit Account No. 50-0951.

### CONCLUSION

For at least the reasons given above, claims 1-4, 10-12, 15-17, 24-29 and 31 define patentable subject matter and are thus allowable. Should the Examiner believe that anything further is necessary in order to place the application in better condition for allowance, the Examiner is respectfully requested to contact the undersigned representative at the telephone number listed below.

No fees in addition to the extension of time fee are believed due; however, the Commissioner is hereby authorized to charge any deficiency, or credit any overpayment, to Deposit Account No. 50-0951.

Respectfully submitted,



Michael K. Dixon  
Reg. No. 46,665  
AKERMAN SENTERFITT  
222 Lakeview Avenue  
Suite 400  
West Palm Beach, Florida 33401-6183  
(561) 653-5000

Attorney Docket No.: 3303-23